Feed the Future Country Fact Sheet

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Giving Seeds an Added Boost to Survive Harsh Sahelian Climates

Ludger Herrmann

By creating microenvironments that can capture moisture and make nutrients more readily available, the seedball has the potential to improve seeding success rates and combat the harsh growing conditions of the Sahel.

The Sahel region of Africa is home to the world's harshest cropping environment, hosting poor, sandy soils, low and erratic rainfall and excessive soil surface temperatures.

The Feed the Future Innovation Lab for Sorghum and Millet, led by Kansas State University, is collaborating with Ludger Herrmann, a researcher from the University of Hohenheim, to improve seeding success rates and combat the Sahel's harsh conditions with a tiny capsule that may revolutionize Sahelian cropping systems: the seedball.

The tiny seedball, a technology that is part of a long-term collaborative research effort with farmer organization Fuma-Gaskiya in the Maradi region of Niger, is small enough to fit in the palm of your hand, but holds the power to change the lives of farmers in the Sahel. Sahelian farmers often have limited space for cropping, very low incomes and restricted access to inputs such as fertilizer and pesticides. This combination of limitations makes it difficult for farmers to subsist on their cropping operations, and nearly impossible to sell their crops for income.

"Millet stand establishment is often a problem with seed emergence followed by intermittent drought, so seedlings die, which forces the farmer to sow again, and then even a third time," said Timothy J. Dalton, Director of the Sorghum and Millet Innovation Lab. By creating microenvironments that can capture moisture and make nutrients more readily available, the seedball has the potential to break this cycle.

Herrmann and his team invested in "local fertilizer" to create the seedballs, using a combination of products that are easily accessible to subsistence farmers in the Sahel. Wood ash, a resource available in every household, provides water soluble phosphate while urine is used to close the nitrogen gap. Potassium from wood ash also allows for stomatal closure (the closing of small openings in the epidermis of plants) in the emerging plant, which allows for higher water use efficiency. Because of this, Herrmann said plants emerging from seedballs have a higher drought tolerance and can survive longer dry spells than plants that are dry scattered as seeds. If so, he said, seedballs will increase labor efficiency and reduce the need to replant.

"These fields often fail to produce yield due to the fact that plants emerge after little rain that is followed by drought," he said. "The nutrient formulation of the seedballs should support early plant growth, root growth in particular, so that seedlings are able to exploit a larger soil volume."

While physical optimization of seedballs may be a challenge, Herrmann said the long-term goal is to define additives so seedball seeds germinate with a defined minimum amount of rainfall.

“We believe that seedballs can improve the local millet and sorghum cropping systems by reducing seed expenditures, increasing seedling survival, enhancing nutrient and water use, and finally by reducing cropping risk, increasing yield and thus income and resilience,” Herrmann said.

The key will be to show that the seedballs are an effective measure to enhance seeding survival and growth in the very early growth stages. Final yield is determined by the length of the growing season, and each day that a crop emerges earlier will increase yield, Herrmann explained.

The seedball is a powerhouse in its miniscule packaging. As a low-cost technology with low application risk for farmers, particularly women, who are often even more limited in their access to inputs, the seedball offers exciting potential in semi-arid landscapes with sandy soils like those found throughout the Sahel.